

REMARKS/ARGUMENTS

Claims 1-3, 5, 9-11, 21, and 23-29 remain pending in this application. Claims 1 and 23 are amended. Support for the new and amended claims can be found in the specification as originally filed. No new matter has been added.

Rejection of Claims Based Upon U.S. Patent No. 5,089,441 to Moslehi et al.

In the latest (final) office action, the Examiner has maintained rejection of certain of the pending claims based upon U.S. Patent No. 5,089,441 to Moslehi et al. ("the Moslehi patent"). These claim rejections are overcome as follows.

The claimed embodiments of the instant application relate to a method of treating a surface with a plasma. In particular, the claimed embodiments describe

generating a plasma discharge including a gas-C, the gas-C comprising a Gas-A molecule containing essentially hydrogen as an element and a Gas-B containing essentially a halogen and/or a halide. (Claim 1)

The Moslehi patent, and the specific HCl:H₂ flow ratio recited therein, are specifically recognized and distinguished by the instant specification as inadequate to achieve the desired result:

[i]n this document, recommended mixing amount of HCl, HBr or HF are, less than 50 SCCM for HCl or HBr into 12000 SCCM H₂ and less than 10 SCCM for HF into 12,000 SCCM H₂. Namely, mixing ratio of 0.42% to total gas flow is preferable for HCl and HBr and that of 0.083% is preferable for HF. From Fig. 3, however, small amount of HCl of about 0.42% scarcely has the effect of transporting atomic hydrogen. (Emphasis added; see page 9, lines 16-29).

Claim 8 of the application as originally filed, recited:

8. The method of claim 6, wherein the flow rate of the molecule of hydrogen-chloride or hydrogen-bromide as Gas-B in total Gas-C flow is defined as the ratio of amount of hydrogen atom in Gas-B to that in Gas-A is larger than 1/480. (Emphasis added)

Accordingly, pending independent claims 1 and 23 have now been amended to incorporate this specific range of hydrogen atom flow ratio.

As a threshold matter, the Examiner is reminded that pending claims Claims 1-2, 5, 9, and 11 stand rejected as anticipated, and not merely obvious, in light of the Moslehi patent:

[t]he distinction between rejections based on 35 U.S.C. 102 and those based on 35 U.S.C. 103 should be kept in mind. Under the former, the claim is anticipated by the reference. No question of obviousness is present. In other words, for anticipation under 35 U.S.C. 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present. (Emphasis added; MPEP 706.02)

Here, the Moslehi patent fails to teach, explicitly or even impliedly, a claimed flow ratio within the range recited by the pending claims.

At col. 5, lines 18-20, the Moslehi patent does describe an HCl/HBr:H₂ flow ratio of less than about 50 sccm:12000 sccm. In terms of atomic hydrogen, however, this flow ratio is less than 1/480 (i.e. 50:12000 sccm x 2: two atoms of hydrogen for each molecule of gas). Because the hydrogen atom flow ratio recited by the Moslehi patent lies squarely beneath the range recited in the pending claims, continued rejection of the pending claims as anticipated by the Moslehi patent is improper, and these claim rejections should be withdrawn.

Claim 10 stands rejected as obvious in light of the Moslehi patent considered in combination with the Grill article. However, nothing in the Grill article can be relied upon to provide a basis for extending the ratio of flowed hydrogen atoms into the claimed range. For at least this reason, claim 10 cannot be considered obvious in light of the references relied upon by the Examiner, and this pending claim rejection should also be withdrawn.

Rejection of Claims Based Upon U.S. Patent No. 5,007,963 to Kikuchi et al.

The Examiner has also rejected certain of the pending claims as obvious under 35 U.S.C. 103 based upon U.S. patent no. 5,007,963 to Kikuchi et al. ("the Kikuchi patent"), considered in view of U.S. patent no. 5,007,983 to Lerner et al. ("the Lerner patent"), and further in view of U.S. patent no. 5,744,049 to Hills et al. ("the Hills patent"). These claim rejections are overcome as follows.

Embodiments accordance with the present invention seek to utilize hydrogen plasma to treat workpieces during the fabrication of semiconductor devices thereon. The instant patent

application specifically recognizes conventional hydrogen plasma techniques employing the introduction of water vapor:

the high concentration atomic hydrogen is obtained in plasma downstream area by the use of mixture of hydrogen and water vapor as the source gas for the plasma. (J. Kikuchi, S. Fujimura, M. Suzuki, and H. Yano), "Effects of H₂O on atomic hydrogen generation in hydrogen plasma," *Jpn. J. Appl. Phys.*, 32, pp. 3120-3124 (1993)).

Conventional plasma processing techniques using hydrogen, however, often cause undesirable results. For example, oxygen bearing plasmas often cause physical and/or electrical damage to surfaces being treated. (Emphasis added; page 1, line 29 - page 2, line 5)

To avoid such issues posed by the presence of oxygen, independent claims 1 and 23 accordingly recite a "plasma discharge is substantially free from an oxygen bearing species".

The Examiner is reminded that in order to establish a prima facie case of obviousness, "there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings." (MPEP 2143)

Here, there is absolutely no teaching or even suggestion in the references relied upon by the Examiner, to utilize a hydrogen plasma that is substantially free from an oxygen containing species.

Specifically, the Kikuchi patent describes formation of a plasma employing HF in combination with water vapor. Given the fact that the water vapor utilized in the Kikuchi patent is an oxygen bearing species, one of ordinary skill in the art would hardly have been motivated to look to the Kikuchi patent for a teaching regarding the oxygen-less plasma described in the pending claims.

Undaunted by this complete lack of teaching or suggestion in the primary reference, the Examiner simply combined this reference with the Lerner patent. However, the Lerner patent also explicitly describes the preferability of using oxygen-containing plasma. (See col. 4, lines 63-66). Such explicit teaching hardly provides the motivation necessary to combine references to properly establish an obviousness rejection.

Finally, and perhaps most tellingly, the Examiner herself found the combination of the Kikuchi and Lerner patents insufficient, and was therefore compelled to further combine these patents with a third (the Hills patent), in order to reject the claims as obvious.

Given the attenuated reasoning and lack of motivation apparent from the combined references, the Examiner is further respectfully reminded that the use of hindsight is never permissible to establish obviousness. See MPEP 2142 and 2143. Absent providing a clear and particular suggestion or motivation to rely upon patents teaching plasma containing an oxygen bearing species, it is respectfully asserted that the Examiner has impermissibly used Applicants' own teaching to hunt through the art to identify the claimed elements and then to combine them as claimed.

On at least this basis, Applicants accordingly respectfully assert that a *prima facie* case of obviousness has not been established. Continued rejection of the pending claims as obvious is improper, and these claim rejections should be withdrawn.

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested. If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



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